

DRAWINGS ATTACHED.

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957,944



Index at Acceptance:—D1 A1K.

International Classification:—D 06 f.

COMPLETE SPECIFICATION.

Improvements in or relating to Automatic Electric Washing Machines.

We, THE ENGLISH ELECTRIC COMPANY LIMITED, of English Electric House, Strand, London, W.C.2, (formerly of Queens House, 28 Kingsway, London, W.C.2), a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to automatic electric washing machines.

In such machines it is customary to provide a temperature control, the setting of which is calibrated either in temperatures or types of fabric to be washed. In general it is adequate to have three temperatures which may conveniently be termed "low", "medium" and "high". The attainment of such temperatures under the control of a timer which determines the entire sequence of washing operations can be by means of a thermostatically controlled mixing valve but this imposes the highest temperature of the source as a limitation on the "high" temperature and also suffers from other disadvantages. Alternatively the machine may be provided with its own heater for raising the water to the required temperature, and the present invention aims at providing simplified control for an automatic washing machine having a timer and a water heater. Such a machine will be referred to hereinafter as "an automatic electric washing machine of the kind specified".

According to the invention, in an automatic electric washing machine of the kind specified, the timer is arranged to be set to any one of a plurality of settings so as to

[Price 4s. 6d.]

determine the washing programme, including one setting in which the temperature of an initial charge of water is raised from cold to a "low" washing temperature by energizing the heater for a predetermined time interval, and another setting in which the water is heated under the control of a thermostat to a "medium" washing temperature, and a manual control switch is provided which is effective in one position to allow heating to continue, once the "medium" temperature has been reached, for a predetermined time interval whereby the water is heated to a "high" washing temperature.

According to a preferred feature of the invention, contacts on the timer are arranged so that, on the second mentioned setting of the timer, the timer is temporarily stopped whilst the water is heated to the "medium" temperature under thermostatic control, the thermostat being arranged so that when the water reaches the "medium" temperature the timer is automatically restarted to de-energize the heater.

According to a further preferred feature of the invention, contacts on the timer are arranged automatically to cause the water to be emptied from the machine at the end of either of the predetermined time intervals or, in cases where heating is not allowed to continue after the "medium" temperature is reached, at the end of a predetermined time interval after the "medium" temperature has been reached, depending on the settings of the timer and the manual control switch.

The three temperatures i.e. "low", "medium" and "high" may be of the order

of, for example, 90—110° F., 130—155° F. and 170—195° F. respectively.

In the accompanying drawings, Fig. 1 is a circuit diagram of an automatic electric washing machine of the kind specified and which embodies the present invention, whilst Fig. 2 is a timer programme chart showing the operation of the timer of Fig. 1.

The machine consists essentially of a washing tub having its axis horizontal, within which rotates on the same axis a basket in which the clothes are washed. Access to the basket is obtained by a closable front opening in the machine casing. A drive motor 20 for the basket is arranged to drive through a change speed mechanism controlled by a solenoid 21 to provide two speeds, a low speed for washing and a high speed for extraction. The solenoid is de-energized for low speed and energized for high speed.

Water is supplied to the machine through a single water connection from an external supply, which may be cold, via an inlet valve controlled by an inlet solenoid 22 and is removed from the machine when necessary by means of a pump driven by the main drive motor and controlled by a pump solenoid 23. The inlet valve is opened by energizing the inlet solenoid and the pump is started by energizing the pump solenoid.

A control switch 24 is provided for controlling the water level and a further manually operated switch 25 is provided for selecting whether the machine should operate on a "medium" temperature or on a "high" temperature. The control switch 24 moves from the position shown to the other position when the water in the machine reaches a predetermined level. A normally open thermostat 26 is provided for ensuring that on certain wash programmes the heater 27 within the machine is cut off upon a "medium" temperature being reached. The washing programme is controlled by a timer 28 driven by a timer motor 29 and provided with contacts identified in the programme chart under appropriate cam numbers. Movement of the timer control knob from the off position automatically closes the main line and neutral contacts.

"Low" temperature is used for programme No. 1 and for this programme the switch 25 may be in either the "up" or the "down" position.

It will be seen from Fig. 2 that movement of the timer control knob to programme No. 1 will result in the closure of contacts 1, 3B, 4 and 5 of the timer, in addition to closure of the main line and neutral contacts. If the switch 25 is in the "up" position a circuit will be prepared for the heater 27 via this switch; if the switch is in the "down" position the circuit will be prepared

via the contacts 1. In either event however the heater will at this stage be maintained de-energized by the water control switch 24.

Contacts 3B complete a circuit through the switch 24 to the water inlet solenoid 22 which accordingly opens the water inlet valve to allow water to flow into the machine. Contacts 4 complete a circuit to the timer motor 29, whilst contacts 5 complete a circuit (via contacts 4) to the basket drive motor 20. Both motors accordingly start up.

When the water reaches a predetermined level in the machine the water control switch 24 moves automatically to its other position so as to de-energize the water inlet solenoid 22, thereby shutting off the water supply, and completing instead the circuit to the heater 27.

Washing now continues for 14 minutes from the start of the programme whereupon the contacts 1 open. At the same time the contacts 3A close to energize the pump solenoid 23 and the water is thus emptied from the machine.

It will be noted here that with the switch 25 in the "up" position the heater 27 will be automatically deenergized by operation of the water control switch 24 when the water in the machine falls below a predetermined level. On the other hand, if the switch is in the "down" position opening of the contacts 1 will result in the immediate de-energization of the heater. In either case however, the heater will be energized for a predetermined time interval, though this interval will be slightly longer if the switch 25 is in the "up" position.

After a further minute contacts 5 open to de-energize the drive motor 20 and a minute later the contacts 4 open to de-energize the timer motor 29. This completes this particular programme, which may be termed a pre-wash cycle.

"Medium" temperature is used for programme No. 3 and for this programme the switch 25 should be set to the "down" position.

As will be seen from Fig. 2, with the timer control knob set to programme No. 3 the same contacts on the timer are closed initially as on programme No. 1 so that the same conditions are obtained at the start of the programme i.e. both motors will be running and the heater will be automatically energized when the water in the machine reaches the required level.

On this programme, however, the contacts 4 of the timer open after two minutes to stop both motors whilst the water is being heated up to the "medium" temperature, whereupon the thermostat 26 closes. This re-completes this circuit to both motors and two minutes later the contacts 4 re-close to complete a circuit for the two motors independently of the thermostat 26. After a

further minute the contacts 1 open to de-energize the heater. Washing then continues with the heater de-energized for a further 16 minutes, whereupon the contacts 3A close to energize the pump solenoid 23. The water is then pumped out of the machine.

"High" temperature is used for programme No. 2 and for this programme the switch 25 should be set to the upper position, as shown, thereby connecting one end of the heater 27 directly to line.

Again, as will be seen from Fig. 2, the same contacts are closed initially so that the machine functions exactly as in programme No. 3, the thermostat closing as before when the water reaches the "medium" temperature to restart both motors.

In this case, however, opening of the contacts 1 will not result in the de-energization of the heater, which is connected directly to the line through the switch 25, and heating of the water is continued for 16 minutes whereupon the contacts 3A close to complete the circuit to the pump solenoid 23. The water is then automatically emptied from the machine and the heater de-energized by operation of the switch 24. The "high" temperature is thus obtained by heating the water for a definite time interval after "medium" temperature has been reached.

On programme Nos. 2 and 3 the timer continues to operate so as to cause the machine to carry out further operations such as, for example a warm rinse or wash followed by a tumbling period, one or more rinses and a spin dry. For spin drying the high speed solenoid 21 is energized through the contacts 2 of the timer so as to cause the drive motor 20 to run at "spin dry" speed. The timer may also be arranged to cause the machine to carry out other additional programmes.

If desired, a further thermostat 30, shown dotted in Fig. 1, may be included in circuit with the heater and arranged to open its contacts at the "high" temperature. Thus, if this temperature is reached before the end of the wash period in programme No. 2, as may happen with small wash loads, the heater will be automatically de-energized.

timer is arranged to be set by any one of a plurality of settings so as to determine the washing programme, including one setting in which the temperature of an initial charge of water is raised from cold to a "low" washing temperature by energizing the heater for a predetermined time interval, and another setting in which the water is heated under the control of a thermostat to a "medium" washing temperature, and including a manual control switch effective in one position to allow heating to continue, once the "medium" temperature has been reached, for a predetermined time interval whereby the water is heated to a "high" washing temperature.

2. An automatic electric washing machine according to Claim 1, including contacts on the timer arranged so that, on the second mentioned setting of the timer, the timer is temporarily stopped whilst the water is heated to the "medium" temperature under thermostatic control, the thermostat being arranged so that when the water reaches the "medium" temperature the timer is automatically restarted to de-energize the heater.

3. An automatic electric washing machine according to Claim 1 or 2, including contacts on the timer arranged automatically to cause the water to be emptied from the machine at the end of either of the predetermined time intervals or, in cases where heating is not allowed to continue after the "medium" temperature is reached, at the end of a predetermined time interval after the "medium" temperature has been reached, depending on the settings of the timer and the manual control switch.

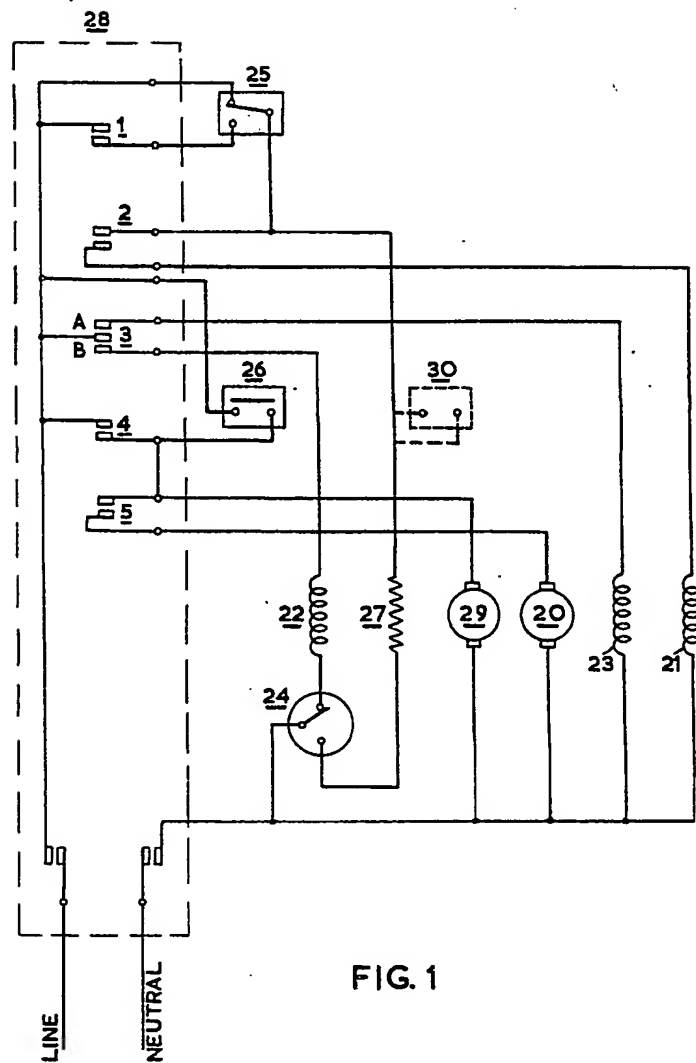
4. An automatic electric washing machine according to any preceding claim, including a further thermostat arranged automatically to de-energize the heater if, with the timer set to the second mentioned setting and the manual control set to allow heating to continue to the "high" temperature, the water reaches the "high" temperature before the end of the predetermined time interval.

5. An automatic electric washing machine substantially as described with reference to the accompanying drawings.

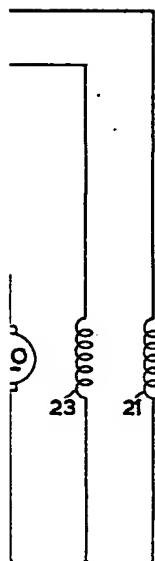
WHAT WE CLAIM IS:—

1. An automatic electric washing machine of the kind specified, wherein the

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Chartered Patent Agent.



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	PRE-WASH			WASH		
TIME INTERVAL IN MINUTES	14	1	2	2	16	1
CAM 1	[Hatched area]			[Hatched area]		
CAM 2						
CAM 3 A B	[Hatched area]			[Hatched area]		
CAM 4	[Hatched area]			[Hatched area]		
CAM 5	[Hatched area]			[Hatched area]		
PROGRAMME N° (START)	1		2	3		

FIG. 2

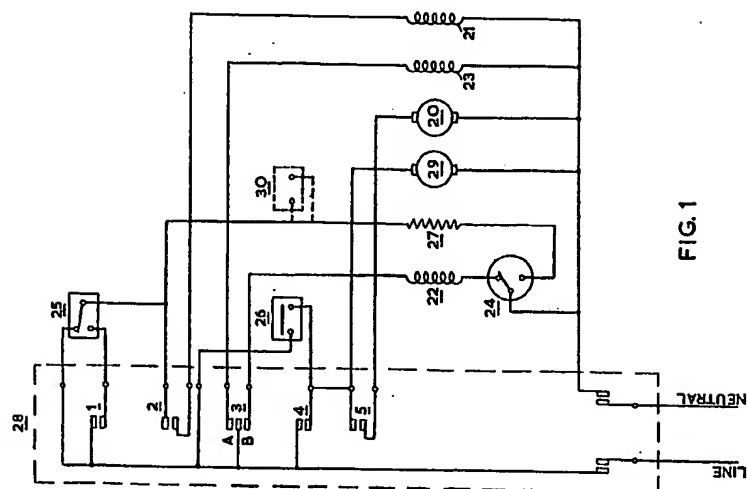


FIG. 1

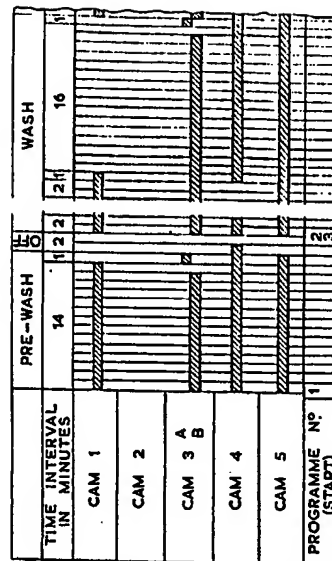


FIG. 2